

Approximately 79% of households in Puerto Rico have access to cable broadband, and 64% have access to DSL service.

2. Broadband Availability by Technology Platform

The June 2011 Puerto Rico broadband inventory database is based on reported network infrastructure from 6 terrestrial, non-mobile broadband providers. Of the broadband platforms available in Puerto Rico, the most ubiquitous technology available across the territory is cable modem service. Across Puerto Rico, cable providers offer service to 79% of households (Table III.2). This estimate is lower than the national estimate of 81% of households nationwide serviced by cable. Digital Subscriber Line (DSL) service is available to 64% of households in Puerto Rico contrasted to U.S. estimates of 88% of DSL penetration. Fixed wireless services are accessible by 40% of households across Puerto Rico. The national estimate for fixed wireless access is 31%. Access to mobile broadband reaches nearly every household in Puerto Rico. The island has four mobile broadband providers that combined provide access to 99.6% of households. That is slightly higher than the terrestrial mobile national estimate of 97%.¹⁷

A wide disparity exists between those households with only fixed broadband available and those with fixed broadband or mobile wireless. Indeed, 86% of households are served by broadband platforms of cable, DSL, and fixed wireless. The inclusion of the mobile platform adds to the number of households significantly and serves 99% of Puerto Rico's households with broadband. That number compares directly with the national estimate of all broadband platform service.¹⁸

Table III.2 - Availability by Broadband Platform - Puerto Rico & U.S. Comparisons			
At least 768 Kbps Download/200 Kbps Upload			
	Puerto Rico Estimates		U.S. Estimates
Platform Type	Served Households (‘000s)	Percent of Households Served	Percent of Households Served
Cable	995	79%	85%
DSL	806	64%	88%
Fixed Wireless	506	40%	31%
Mobile	1,256	99.6%	97%
All Platforms Except Mobile	1,084	86%	N/A
All Platforms	1,267	99.7%	99%

Source: For Puerto Rico estimates, Connect Puerto Rico, June 2011. For U.S. estimates, National Broadband Map, NTIA, December 2010 (which is the latest data available at the national level).

Note: NTIA's National Broadband Map data does not provide estimates for terrestrial service offering excluding mobile broadband.

3. Household Density Across Unserved Areas in Puerto Rico

In this subsection, we examine the household density across unserved areas in Puerto Rico. Household density (or number of households per square mile) is a key driver of infrastructure build-out costs in any network industry. Broadband is no exception and, not surprisingly, the National Broadband Map reports that across America the broadband gaps remain mostly across low density, rural areas. Puerto Rico is no exception and data shows that unserved areas tend to be less populated. However, the household density across unserved areas or areas that remain underserved (they may have basic broadband available but are unserved at higher speeds) is significantly higher than across the U.S.


Across Puerto Rico the average household density is 368, varying greatly by municipality as reported in the following segment.¹⁹ Table III.3 reports average household density across Census Blocks that are unserved by basic broadband service based on NTIA definitions (768 Kbps download/200 Kbps upload) and those with higher speeds service.²⁰ These measures provide an objective means to assess the infrastructure in unserved or served areas.

The average density of households in populated areas without any form of broadband is 106 households per square mile. By contrast, the average density of households in populated areas with service of at least 768 Kbps / 200 Kbps speeds is 957 households per square mile – significantly higher than the average of 368 households per square mile. Across populated areas that have broadband available at speeds of at least 3 Mbps download / 768 Kbps upload, there are an estimated 1,548 households per square mile.

Table III.3 - Average Number of Households Per Square Mile For Census Blocks with Households Served by Terrestrial Broadband

Capacity Available	Density of Households
No Broadband Available	106
At least 768 Kbps/200 Kbps	957
At Least 3 Mbps/768 Kbps	1,548

Source: Connect Puerto Rico, June 2011.



In comparison to the diverse geographic landscape of Puerto Rico between the connected urban areas and unconnected remote areas, the state of Texas also presents the same unique connectivity challenge. However, Texas has a considerably lower density of households unserved by at least 768 Kbps download / 200 Kbps upload speeds. The average statewide density of households in Texas is 28.24, much lower than Puerto Rico's demographic density.²¹ Yet, investment in broadband infrastructure has taken place across Texas in areas that are on average much less populated than the average unserved areas in Puerto Rico. The average density of households across populated areas without any broadband in Texas is just 3.76 households per square mile, drastically contrasting with the above-mentioned estimate for Puerto Rico of 106 households per square mile.²² This data suggests that broadband economics are different across the two jurisdictions. In the second part of this chapter, we discuss broadband adoption rates by households across Puerto Rico and find that they are significantly lagging behind much of the U.S. Such demand factors are key drivers of the economics of network build-out.

4. Broadband Availability Across Puerto Rico Municipalities

This section examines broadband availability across Puerto Rico's 78 municipalities, focusing first on broadband inventory estimates offering service of at least 768 Kbps download and 200 Kbps upload, then service of least 3 Mbps download and 768 Kbps upload, and finally service of at least 6 Mbps download and 1.5 Mbps upload. These service offerings are the three main technology platforms available in Puerto Rico.

a. Municipality-Level Broadband Availability

Beginning at the basic speed tier for broadband (at least 768 Kbps download and 200 Kbps upload speeds), Figure III.5 below is a municipality analysis of the broadband availability. Figure III.6 depicts broadband availability of at least 3 Mbps download and 768 Kbps upload across Puerto Rico by municipality. Finally, Figure III.7 below depicts broadband availability at the speeds of at least 6 Mbps download and 1.5 Mbps upload across Puerto Rico by municipality.

What these data reveal supports the notion that the broadband landscape across Puerto Rico varies greatly by community (Table III.4). Detailed information on the estimated inventory of broadband in each municipality can be found on the Connect Puerto Rico website at <http://www.connectpr.org/mapping/municipalities>.

For more granular information regarding the estimated broadband inventory, see the Puerto Rico online broadband inventory map at <http://www.connectpr.org/mapping/island>.

Across Puerto Rico's municipalities, broadband availability varies widely. While in San Juan all households are served, in Las Marias municipality only 35% of households have access to fixed broadband.

Figure III.5 - Broadband Availability Across Puerto Rico - By Municipality - At Least 768 Kbps Download and 200 Kbps Upload Speeds, June 2011

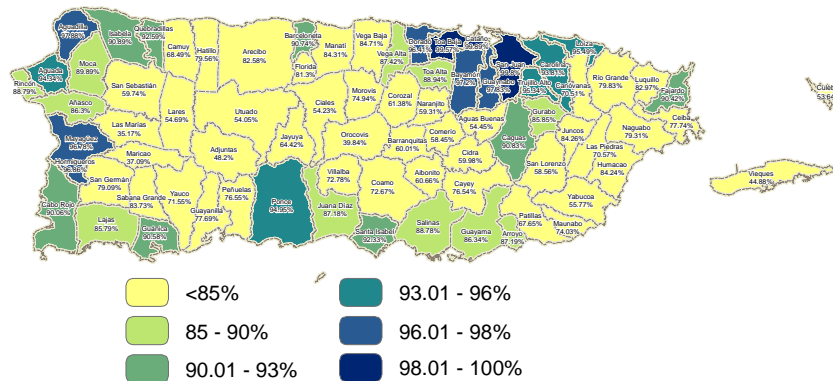


Figure III.6 - Broadband Availability Across Puerto Rico - By Municipality - At Least 3 Mbps Download and 768 Kbps Upload Speeds, June 2011

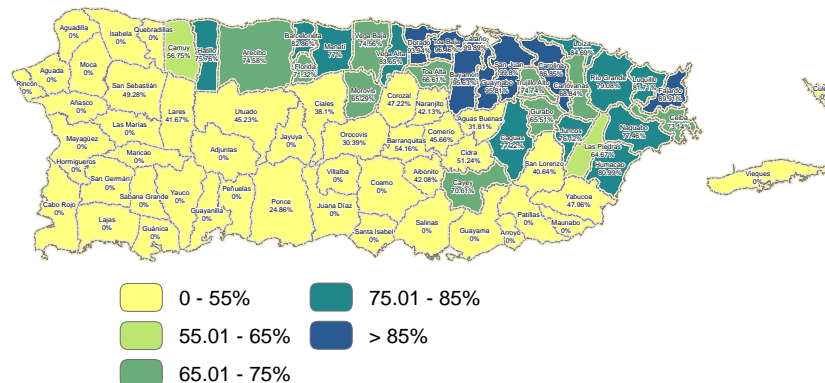


Figure III.7 - Broadband Availability Across Puerto Rico - By Municipality - At Least 6 Mbps Download and 1.5 Mbps Upload Speeds, June 2011

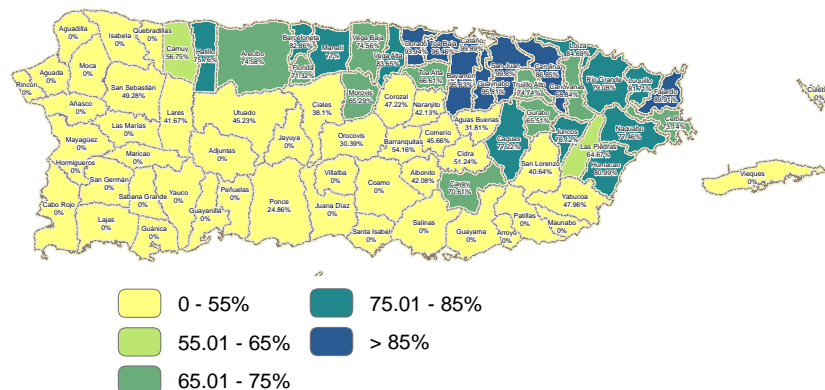


Table III.4 - Availability of Broadband Service by Municipality by Speed Tier

Terrestrial Broadband Excluding Mobile						
				Percentage of Households Served by Speed Tier		
Municipality	Median Household Income	Household Density	Number of Households ('000s)	≥ 768 Kbps Download/ 200 Kbps Upload	≥ 3 Mbps Download/ 768 Kbps Upload	≥ 6 Mbps Download/ 1.5 Mbps Upload
Adjuntas	\$11,983	88.4	6	48%	0%	0%
Aguada	\$14,103	437.1	14	94%	0%	0%
Aguadilla	\$13,956	603.6	22	98%	0%	0%
Aguas Buenas	\$14,751	302.3	9	55%	32%	31%
Aibonito	\$15,487	268.7	8	61%	42%	42%
Anasco	\$15,244	239.3	9	86%	0%	0%
Arecibo	\$16,564	271.8	34	83%	75%	75%
Arroyo	\$14,815	410	6	87%	0%	0%
Barceloneta	\$16,124	402.4	8	91%	83%	83%
Barranquitas	\$14,751	253.2	9	60%	54%	54%
Bayamon	\$25,294	1660.5	74	97%	96%	0%
Cabo Rojo	\$15,809	243.3	17	90%	0%	0%
Caguas	\$22,951	800	47	91%	77%	77%
Camuy	\$14,985	246.8	11	68%	57%	57%
Canovanas	\$21,934	409.3	13	71%	69%	69%
Carolina	\$28,262	1401.9	64	94%	87%	16%
Catano	\$18,144	1999.6	10	100%	100%	18%
Cayey	\$19,040	301.2	16	77%	71%	71%
Ceiba	\$18,461	198	6	78%	73%	73%
Ciales	\$13,564	90.7	6	54%	38%	38%
Cidra	\$21,293	365.9	13	60%	51%	51%
Coamo	\$15,028	150.6	12	73%	0%	0%
Comerio	\$12,927	222.3	6	58%	46%	46%
Corozal	\$14,077	264.5	11	61%	47%	45%
Culebra	\$19,868	60.2	1	54%	0%	0%
Dorado	\$25,473	466.7	11	96%	94%	83%
Fajardo	\$19,803	474.6	14	90%	90%	90%
Florida	\$16,246	260.8	4	81%	71%	71%
Guanica	\$11,870	196.5	7	91%	0%	0%
Guayama	\$17,214	218.6	14	86%	0%	0%
Guayanilla	\$14,243	170.2	7	78%	0%	0%
Guaynabo	\$33,279	1255.7	34	98%	96%	5%
Gurabo	\$27,416	421.7	12	86%	66%	65%
Hatillo	\$16,246	303.6	13	80%	76%	76%
Hormigueros	\$19,834	514.1	6	97%	0%	0%
Humacao	\$18,354	430.9	19	84%	81%	81%
Isabela	\$13,028	270.4	15	91%	0%	0%
Jayuya	\$15,556	114	5	64%	0%	0%
Juana Diaz	\$16,496	248	15	87%	0%	0%
Juncos	\$17,694	448.8	12	84%	76%	76%
Lajas	\$14,500	149.9	9	86%	0%	0%
Lares	\$12,199	178.6	11	55%	42%	42%
Las Marias	\$13,847	76.9	4	35%	0%	0%

				Percentage of Households Served by Speed Tier		
Municipality	Median Household Income	Household Density	Number of Households ('000s)	≥ 768 Kbps Download/ 200 Kbps Upload	≥ 3 Mbps Download/ 768 Kbps Upload	≥ 6 Mbps Download/ 1.5 Mbps Upload
Las Piedras	\$17,680	329	11	71%	65%	65%
Loiza	\$19,460	493.7	10	95%	85%	85%
Luquillo	\$19,672	255.8	7	83%	82%	82%
Manati	\$16,564	338	15	84%	77%	77%
Maricao	\$10,932	55	2	37%	0%	0%
Maunabo	\$15,255	189.8	4	74%	0%	0%
Mayaguez	\$14,059	447.5	35	97%	0%	0%
Moca	\$12,841	252.8	13	90%	0%	0%
Morovis	\$13,646	226.4	9	75%	65%	65%
Naguabo	\$15,250	152.3	8	79%	77%	77%
Naranjito	\$14,275	329	9	59%	42%	29%
Orocovis	\$13,713	111.6	7	40%	30%	30%
Patillas	\$14,860	140.8	7	68%	0%	0%
Penuelas	\$14,872	173.5	8	77%	0%	0%
Ponce	\$16,902	519.6	60	95%	25%	25%
Quebradillas	\$11,943	365.6	8	93%	0%	0%
Rincon	\$16,067	360.4	5	89%	0%	0%
Rio Grande	\$20,850	270.5	16	80%	79%	79%
Sabana Grande	\$15,497	247	9	84%	0%	0%
Salinas	\$13,118	147.1	10	89%	0%	0%
San German	\$15,016	235	13	79%	0%	0%
San Juan	\$23,478	3418.3	163	100%	100%	55%
San Lorenzo	\$17,477	247.2	13	59%	41%	41%
San Sebastian	\$12,115	212.4	15	60%	49%	49%
Santa Isabel	\$17,605	198.6	7	92%	0%	0%
Toa Alta	\$25,133	709.5	19	89%	67%	0%
Toa Baja	\$23,297	1314.9	30	100%	96%	0%
Trujillo Alto	\$30,825	1164.3	24	95%	75%	0%
Utua	\$13,509	98.8	11	54%	45%	45%
Vega Alta	\$16,608	428.6	12	87%	84%	76%
Vega Baja	\$16,530	430.6	20	85%	75%	74%
Vieques	\$16,220	65.3	3	45%	0%	0%
Villalba	\$15,455	217.9	8	73%	0%	0%
Yabucoa	\$16,894	221.6	12	56%	48%	48%
Yauco	\$14,314	220.3	15	72%	0%	0%

Source: Household Numbers and Density - Census Bureau, 2000. Broadband Availability Rates - Connect Puerto Rico, June 2011.

b. Municipality-Level Broadband Availability by Platform

In Table III.5 platform availability is reported by municipality. Estimates include broadband service at speeds of at least 768 Kbps download and 200 Kbps upload offered by cable, DSL, and fixed wireless technologies. The results in this table show the variation in availability to broadband platforms across municipalities in Puerto Rico.

Table III.5 - Municipality-Level Availability by Broadband Technology							
Percentage of Households Served by Broadband, by Technology Platform							
(≥ 768 Kbps Download / 200 Kbps Upload Speeds)							
Municipality	Cable	DSL	Fixed Wireless	Municipality	Cable	DSL	Fixed Wireless
Adjuntas	37%	41%	0%	Lajas	84%	44%	0%
Aguada	92%	55%	1%	Lares	42%	42%	0%
Aguadilla	98%	74%	0%	Las Marias	31%	27%	0%
Aguas Buenas	31%	38%	8%	Las Piedras	65%	51%	0%
Aibonito	42%	56%	0%	Loiza	85%	63%	7%
Anasco	78%	61%	62%	Luquillo	82%	13%	0%
Arecibo	75%	63%	0%	Manati	77%	73%	0%
Arroyo	85%	48%	0%	Maricao	0%	37%	0%
Barceloneta	83%	74%	0%	Maunabo	65%	58%	0%
Barranquitas	54%	26%	0%	Mayaguez	93%	76%	59%
Bayamon	94%	86%	93%	Moca	88%	41%	0%
Cabo Rojo	86%	63%	1%	Morovis	65%	61%	0%
Caguas	77%	72%	72%	Naguabo	77%	40%	0%
Camuy	57%	49%	0%	Naranjito	29%	38%	15%
Canovanas	69%	11%	24%	Orocovis	30%	26%	0%
Carolina	86%	52%	90%	Patillas	67%	24%	0%
Catano	86%	83%	100%	Penuelas	73%	61%	0%
Cayey	71%	65%	0%	Ponce	90%	87%	65%
Ceiba	73%	30%	0%	Quebradillas	89%	58%	0%
Ciales	38%	48%	0%	Rincon	85%	50%	1%
Cidra	51%	41%	1%	Rio Grande	79%	29%	0%
Coamo	69%	64%	0%	Sabana Grande	81%	65%	0%
Comerio	46%	51%	0%	Salinas	74%	83%	0%
Corozal	45%	49%	7%	San German	73%	59%	0%
Culebra	0%	54%	0%	San Juan	100%	76%	99%
Dorado	83%	73%	67%	San Lorenzo	41%	49%	7%
Fajardo	90%	24%	0%	San Sebastian	49%	45%	0%
Florida	71%	75%	0%	Santa Isabel	85%	83%	0%
Guanica	84%	75%	0%	Toa Alta	57%	79%	38%
Guayama	82%	82%	0%	Toa Baja	84%	80%	93%
Guayanilla	73%	66%	0%	Trujillo Alto	74%	86%	76%
Guaynabo	94%	73%	90%	Utuado	45%	46%	0%
Gurabo	65%	65%	46%	Vega Alta	76%	68%	31%
Hatillo	76%	57%	0%	Vega Baja	74%	79%	2%
Hormigueros	95%	65%	8%	Vieques	0%	45%	0%
Humacao	81%	62%	0%	Villalba	64%	57%	0%
Isabela	90%	60%	0%	Yabucoa	48%	39%	0%
Jayuya	56%	51%	0%	Yauco	71%	9%	0%
Juana Diaz	84%	75%	0%				
Juncos	76%	63%	1%	TOTAL	79%	64%	40%

Source: Connect Puerto Rico, June 2011

C. Puerto Rico Broadband and Information Technology Adoption

This section analyzes data regarding broadband adoption and usage across the Puerto Rico residential and business sectors. The analysis measures the extent of the digital divide in Puerto Rico and the factors driving it. The section concludes with normative recommendations aimed to achieve digital inclusion across some of the more vulnerable populations in Puerto Rico.

The analysis is based on two core sources of data; the 2010 Puerto Rico Residential Technology Assessment, consisting of a random digital dial survey (RDD) of 1,200 Puerto Rico households, and the 2010 Business Technology Assessment, an RDD survey of 814 business establishments. Both of these surveys were conducted by Connect Puerto Rico on behalf of the Puerto Rico OCIO as part of the State Broadband Initiative (SBI) federal grant program, and funded through the American Recovery and Reinvestment Act.²³ Extensive results of this survey research, beyond the key data highlighted in this section can be found online at the following websites:

2010 Puerto Rico Residential Technology Assessment

- http://en.connectpr.org/research/residential_technology_assessment.php

2010 Puerto Rico Business Technology Assessment

- http://en.connectpr.org/research/business_technology_assessment.php

1. The Residential Broadband Adoption Gap

This section analyzes the technology adoption gap across Puerto Rico's residential sector. The analysis is based on the 2010 Connect Puerto Rico Residential Assessment, a consumer survey implemented by Connect Puerto Rico in 2010 aimed at understanding demand-side trends and barriers in the Puerto Rico broadband market. Topics of the consumer survey included computer ownership, broadband adoption, awareness of available broadband service, and residential uses for Internet. In addition, the survey was designed to track information about barriers to technology adoption, including barriers to computer ownership, Internet usage, and broadband adoption.

This section summarizes the main findings of the research and contrasts the Puerto Rico data with U.S. benchmarks released by the National Telecommunications and Information Administration (NTIA), as well as the Federal Communications Commission (FCC) as part of the National Broadband Plan.²⁴ The purpose of this section is to better understand the drivers and barriers to technology and broadband adoption and estimate the "Broadband Adoption Gap" across Puerto Rico.

More than two-thirds (69%) of Puerto Rico residents do not subscribe to home broadband service.

Residential data were collected by telephone through live computer-assisted interviews from an island-wide random digit dial (RDD) sample of 1,000 households and 200 cell phone users contacted between May 15 and June 9, 2010. The questionnaire screened to include only adults age 18 or older with quotas set by gender, age, and municipality of residence (urban, suburban, or rural) to ensure adequate representation of all adults on the island. The margin of error for this assessment is $\pm 3.1\%$ at the 95% level of confidence. Data were collected by Estudios Tecnicos in San Juan, PR. Weights were applied to correct for minor variations and to ensure that the sample matches the most recent U.S. Census estimate of the island's population by age, gender, and urban/rural classification of the respondent's municipality of residence. Weighting and research consultation were provided by Lucidity Research, LLC.²⁵

In 2010, more than two-thirds (69%) of Puerto Rico residents did not subscribe to broadband service in the home, an adoption gap that is significantly higher than the U.S. adoption gap measured by U.S. Department of Commerce.²⁶

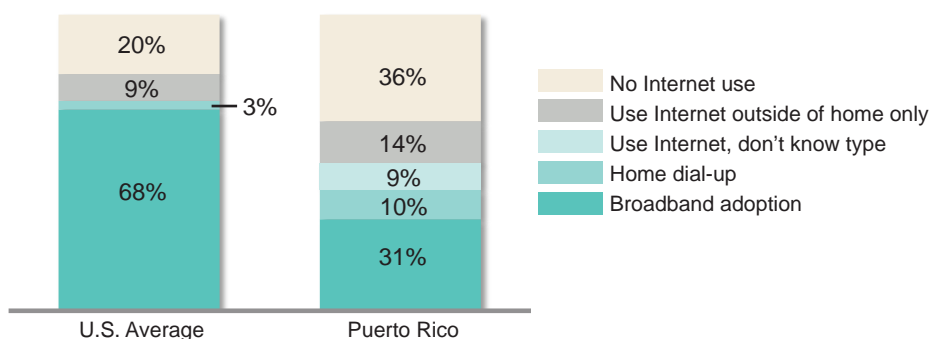
The percentage of households across Puerto Rico that have broadband service in the home is 31%; by comparison, a 2010 survey of U.S. residents revealed that 68% of American households subscribe to home broadband service.²⁷ Furthermore, nearly two-thirds of Puerto Rico broadband subscribers (63%) began subscribing within the past two years.

The technology gap in Puerto Rico also extends to technology devices. Across the island, 55% of all residents own a home computer, compared to 77% of U.S. households nationwide.²⁸ This translates into more than 1.3 million adults in Puerto Rico without a home computer, with 27% of those same adults stating that cost was the major limiting factor. Furthermore, 62% of Puerto Rico adults report owning a cellular phone, compared to 86% of U.S. residents.²⁹

Furthermore, Connect Puerto Rico's 2010 Residential Technology Assessment indicates that 10% of residents subscribe to dial-up service at home, and 9% are not certain whether they subscribe to broadband or dial-up in their home. Additionally, 14% of adults surveyed report that their only way of accessing the Internet is at a location outside their home. A total of 64% of Puerto Ricans report that they access the Internet from either their home or another location; in contrast, 80% of U.S. adult residents reported accessing the Internet from their home or someplace else in 2010.³⁰ Across Puerto Rico, 50% of adults surveyed reported accessing the Internet from home, 11% from work, and 3% from a library. Eighteen percent of Puerto Rico residents access the Internet via a cell phone or mobile phone. Finally, 36% report that they do not use the Internet at all, as shown in Figure III.8.

Nationwide, 68% of American households subscribed to broadband service in 2010; 3% of Americans had a dial-up Internet connection at home; 9% of Americans were Internet users but did not access the Internet from home; and 20% of Americans were not Internet users (Figure III.8).³¹ These statistics indicate that the Internet use and broadband gaps in Puerto Rico are significantly more severe than in the rest of the United States.

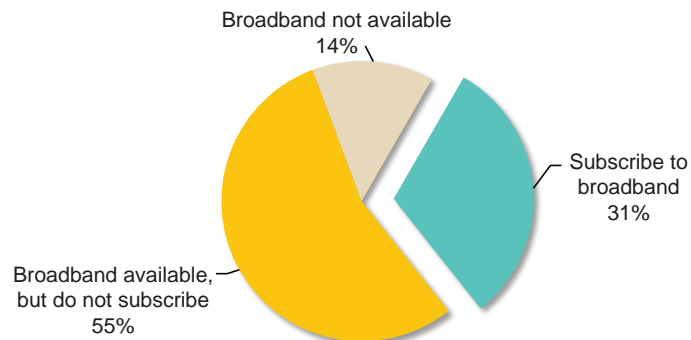
Figure III.8 - Residential Technology Adoption Comparison



According to Connect Puerto Rico's broadband inventory estimates, 86% of all Puerto Rico households have fixed broadband available (or are served) at the basic speeds of 768 Kbps download/200 Kbps upload.³² Puerto Rico's 31% broadband adoption rate indicates that approximately 55% of Puerto Rico residents have broadband available, but, for various reasons, are choosing not to subscribe to the service in the home, as show in Figure III.9.

Puerto Rico's broadband adoption gap suggests that when it comes to broadband, the old adage of "build it and they will come" does not always work. The FCC's National Broadband Plan concludes that the adoption gap needs to be tackled at the federal, state, and local levels through a series of complementary strategies. The National Broadband Plan also recommends modernizing programs aimed at increasing adoption rates for low-income people to support broadband, improve participation in the digital economy and society, and protect against waste, fraud, and abuse.

Figure III.9 - Puerto Rico Broadband Adoption Gap



a. Broadband Adopters and Non-Adopters

In October 2010, the U.S. Census Bureau, in collaboration with the National Telecommunications and Information Administration, surveyed approximately 54,300 households regarding their technology use and extrapolated their results to represent 119.5 million American households.³³ The survey analyzed computer ownership and broadband Internet use at the household level and its association with household-level characteristics. The data collected indicates that broadband non-adopters are generally people of low-income, senior citizens, members of ethnic minorities, rural dwellers, people with disabilities, and/or people with less education.

These trends are in line with non-adoption rates reported by similar demographic groups in Puerto Rico; however, the adoption gap in Puerto Rico for each of these demographic groups is more acute. Figure III.10 contrasts Puerto Rico and U.S. adoption gaps among selected demographic groups.³⁴ While 31% of Puerto Rican residents subscribe to broadband, senior citizens, low-income residents, adults with disabilities, and adults with lower educational levels disproportionately find themselves on the wrong side of the digital divide. The broadband adoption rate is 5% among adults 65 and older; 7% among residents without a high school diploma; 15% among households with annual incomes below \$15,000; 21% among adults with disabilities; and 34% among rural households. Plans to stimulate broadband and technology adoption need to incorporate strategies specifically targeting these demographic groups.